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Teaching Forward Contracts in Undergraduate Courses in Agribusiness Programs

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Teaching Forward Contracts in Undergraduate Courses in Agribusiness Programs

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Introduction: Forward Contracts

- **Market exchange** mechanisms
- Facilitate (coordinate) **efficient movement** of **products and payments** throughout the supply chain
- **Sellers'** perspective: **Marketing** contracts
- **Buyers'** perspective: **Input procurement** (purchasing) contracts

Objective

- To develop **a set of teaching materials** to be used to explain the **mechanics of forward contracts to undergraduate students**
- The material is suitable for courses in the areas of **agribusiness management, agricultural marketing, supply chain management and agricultural commodity futures markets**
- Teaching materials include: a **teaching note** (summarized in this poster), a **forward contract check list**, a **forward contract framework** and **a problem set demonstrating its application** in the **milk supply chain**
  - Are included as the attachment to the PDF poster available on AgEcon Search

Economic Framework: Market Exchange

Market Exchange: *Key Elements*
- **Product** (assume a certain **quantity** is or will be available in the future)
- **Seller** originally **owns the product ->** has the **title/ownership of the product**
- **Buyer intends to purchase the product** -> will **pay the price**

Market Exchange: *Process and Outcome*
- **Seller** and **Buyer** reach **agreement** on **product *Quantity* and *Price***
- **Product *Quantity & Title* are exchanged for *Price*** (i.e. payment)
- The transfer of the product title/ownership takes place
  - ***Seller*** receives payment and transfers the product and its title to ***Buyer***
  - ***Buyer*** accepts the product and its title and makes payment (pays the price)

Economic Framework: Market Exchange (cont.)

P is product **price** ($ per unit) and **Q** is product **quantity** (units)
$ value of the market exchange (contract): P*Q (in $)

Seller's perspective (product is output)
P is **price received/selling price/output price/price charged**
Q is product **quantity sold; P*Q is revenue -> positive effect on profit**
Business/economic incentive is to negotiate a higher price

Buyer's perspective (product is input)
P is **price paid/payment made**
Q is product **quantity purchased; P*Q is costs -> negative effect on profit**
Business/economic incentive is to negotiate a lower price

Profit formula: Profit = Revenue – Costs = Poutput*Qoutput – Pinput*Qinput

Legal Framework: Uniform Commercial Code (UCC)

Contracts for sale/purchase of goods
https://www.law.cornell.edu/ucc

- If Seller and Buyer have a very simple contract
  - They do not specify all terms and conditions
- And *if there is a disagreement (dispute) later*, the UCC rules apply

UCC defines "**Contract for sale of goods**" as the one which
- **"includes both a *present sale* of goods and a contract to sell goods *at a future time*"**
- "A "**sale**" consists in **the passing of title** from the seller to the buyer **for a price**"

A **contract for sale/purchase of goods MUST explain/provide**
- **Description of the *product*** being sold/purchased
- **The product *quantity*** OR a procedure of the product quantity determination
- **Contract** must be in writing, if for $500 or more

Contracts for Sale/Purchase of Goods: *Reaching* Agreement vs *Executing* Agreement

STEP 1 (TODAY): *Reaching* agreement or signing a contract
- Seller and Buyer reach agreement on product quantity to be sold/purchased and product price to be paid/received

STEP 2 (FUTURE): *Executing* agreement (contract) or performing contract
- Seller delivers the product to Buyer
- Buyer accepts the product and makes a payment

TWO TYPES of contracts for sale (UCC classification)

PRESENT SALE: If step 1 and step 2 take place on the same day or within a few days (TODAY = FUTURE) -> **spot market contracts**
FUTURE SALE: If there is a time period between step 1 and step 2 (TODAY≠ FUTURE) -> **Forward contracts**

- Video "Cash Markets and Forward Contracting"
  https://www.youtube.com/watch?v=L2rILKjj-Gc

Contracts for Sale/Purchase of Goods: Spot Market Contracts (*Present* Sales)

Spot market transaction/sale/contract is a ***present* sale**
Spot market prices are referred to as **spot prices**

Representative spot market settings
- Retailers (supermarkets) sell food items to final consumers
- Wholesalers sell domestic and imported produce at terminal markets
  - Buyers are other wholesalers and retailers
- Ag producers sell ag products at shipping points located in large ag production regions
  - Buyers are wholesalers and retailers

Contracts for Sale/Purchase of Goods: Forward Contracts (*Future* Sales)

- **Forward contract** is a ***future* sale**
- The **Seller** and **Buyer** perspectives: ***forward* contract**
- The **Seller**'s perspective: ***marketing* contract**
- **Forward contract prices** are referred to as **forward prices**

Representative forward contracts settings
- Large food processors purchase large quantities of ag products (inputs) from agricultural producers using forward contracts (i.e. input procurement)

Contracts specify
- The product quantity and/or the product quantity determination procedure
- The product delivery schedule
- The price and/or the price determination procedure (for example, a price formula)

Forward Contract: Definition and Mechanics

A **forward contract** is **a legally binding agreement** between **Seller** of the **product** and **Buyer** of this product **signed Today**, according to which
- **Seller will deliver the product** to **Buyer** on a certain date **in the Future** and
- **Buyer will pay** to **Seller in the Future the price determined Today (forward price)**
- There is a **period of time between** the **moment the contract is signed** (TODAY) **and the moment the product delivery takes place** (FUTURE)
  - May vary from several days to several months

TODAY
- **Seller and Buyer reach agreement** on **product quantity and price** (contract is signed)
- The product price or the price determination procedure to be used in the future is determined
- The product quantity or the quantity determination procedure to be used in the future is determined

FUTURE
- **Seller delivers the product to Buyer**
- The actual payment is calculated; **Buyer makes the payment to Seller**
- The product title is transferred from Seller to Buyer

Why Do Firms Use *Forward* Contracts? General Answer: *A Proper Business Planning*

Production planning: the product is an input for the firm acting as a buyer
- Input quantity affects output quantity produced
- *Input purchasing* (i.e. input procurement) -> *cost* side of the business

Marketing (sales) planning: the product is an output for the firm acting as a seller
- Securing the buyer(s) of the product -> *marketing*/distribution channels -> *revenue* side of the business

Risk management: managing (reducing) uncertainty related to quantity and price
- *Production risks:* uncertainty related to product quantity produced
- *Marketing risks:* uncertainty related to product quantity marketed
- *Price risks:* uncertainty related to price (input price or output price)
- Sellers and Buyers lock into prices and quantities today, while the product delivery is in the future

Handout: Contract for Sale/Purchase of Goods
Check List: A *Generic* Version

Contract term	**Paragraph #**	**Brief description**
SELLER		
BUYER		
PRODUCT		
Product *Quantity* and/or *procedure of its determination* in the future		
Product *Price* and/or *procedure of its determination* in the future		
Product *Quality* and/or *procedure of its determination* in the future		
The product *ownership (title) transfer* from the seller to the buyer: !!! The *EXACT* MOMENT!!!		
Contract *duration*		
***Transportation* of the product: PARTY responsible**		
***Schedule of deliveries:* PARTY responsible**		
Other terms and conditions not listed above		

Handout: *FORWARD* CONTRACTS FRAMEWORK
ECONOMIC EFFECTS: The SELLER and BUYER Perspectives
"*Mechanics of Forward Contracts*"

There is a **product** which theoretically can be sold/purchased using a forward contract or a spot market/contract.
The product is sold/purchased using a forward contract.
There is a **seller** of this product and a **buyer** of this product (contract parties).
There are two points in time: TODAY and LATER/FUTURE (assume there is a time lag of several weeks or a few months).

TODAY: Seller and Buyer sign a *forward* contract (they decided not to use a spot market)
They make an **agreement** on **product *quantity* and product *price* (Forward Price: FP)**

LATER/FUTURE: Seller delivers the product (quantity) to Buyer and receives the price Buyer pays (Forward Price)
Buyer accepts the product (quantity) from Seller and makes a payment to Seller (Forward Price)

Spot market (contract) is an alternative to a forward contract. While it is not used by Seller and Buyer, its prices for TODAY and LATER/FUTURE are used as reference prices to understand the economic effects of forward contract on Seller and Buyer.

The spot (cash) price typically changes between TODAY and LATER (increases or decreases).
TODAY we do not know whether spot (cash) price will increase or decrease between TODAY and LATER
This is one of the reasons why forward contracts are used as a risk management mechanism.

Recall: Profit = Revenue – Costs = P output * Q output – P input * Q input

Handout: Forward Contract Framework

SPOT (CASH) MARKET Product is sold/purchased on the spot. Price (cash payment) is paid on the spot	**FORWARD CONTRACT (FC)**: Between Seller and Buyer	
	Seller *Sells* the product: *Output* for seller *Output Price* Received affects *Revenue*	**Buyer** *Buys* the product: *Input* for buyer *Input Price* Paid affects *Cost*
TODAY **Cash Price = $XX/unit**	Seller and Buyer **sign a forward contract TODAY:** Agree on product **quantity (Q)** and product **price -> "*Forward Price*" (in $/unit) "FP"**	
LATER/FUTURE **Cash Price = $YY/unit** "**CPL**"	**Seller** delivers the product to Buyer and receives price (FP)	Buyer accepts the product from Seller and pays price (FP)
	To evaluate the economic effects (gain or loss) of forward contract on Seller and Buyer: **Compare Forward Price (FP) and Cash Price LATER (CPL)**	
	Scenario 1: FP > CPL -> FP – CPL > 0	
	Seller *Gains* **FP > CPL -> FP – CPL > 0** **Seller** has *increased* the *output (selling) price* by using FC *Seller's* ***revenue increases*** *->* *Seller's* ***profit increases***	**Buyer *Loses*** **FP > CPL -> FP – CPL > 0** **Buyer** has *increased* the *input* (purchasing) *price* by using FC *Buyer's* ***cost increases*** *->* *Buyer's* ***profit decreases***
	Scenario 2: FP < CPL -> FP – CPL < 0	
	Seller *Loses* **FP < CPL -> FP – CPL < 0** **Seller** has *decreased* the *output (selling) price* by using FC *Seller's* ***revenue decreases*** *->* *Seller's* ***profit decreases***	**Buyer *Gains*** **FP < CPL -> FP – CPL < 0** Buyer has *decreased* the *input* (purchasing) *price* by using FC *Buyer's* ***cost decreases*** *->* *Buyer's* ***profit increases***

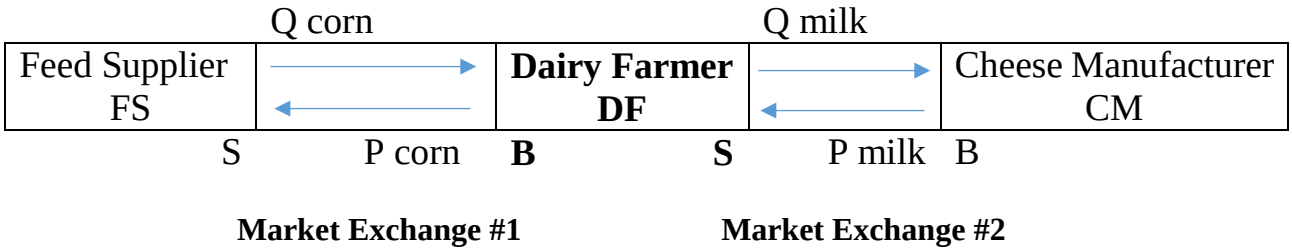
Seller: Total Gain/Loss ($) = Price difference ($/unit) * Quantity (units)
Buyer: Total Gain/Loss ($) = Price difference ($/unit) * Quantity (units)
Price difference ($/unit) = Forward Price ($/unit) – Cash Price Later ($/unit)
Forward contract $ value = Forward price ($ per unit) * Quantity (units)

Problem Set: Forward Contracts in the *Milk* Supply Chain

Evaluating Economic Effects of Forward Contracting

"Mechanics of Forward Contracts"

Milk supply chain



Market Exchange #1: Decision Situation #1 for Dairy Farmer (Q1 and Q2)

- Animal feed supplier (Seller) -> Dairy farmer (Buyer)
- Product: corn
- ***2 scenarios in our analysis: differ due to the pattern of price changes (cash and forward)***

Market Exchange #2: Decision Situation #2 for Dairy Farmer (Q3 and Q4)

- Dairy farmer (Seller) -> Cheese manufacturer (Buyer)
- Product: milk
- ***2 scenarios in our analysis: differ due to the pattern of price changes (cash and forward)***

Question 1: Dairy Farmer: *Decision Situation #1*
Dairy farmer *purchases corn* from animal feed supplier
An *input (feed)* forward contract: *Scenario #1*

TODAY: Corn Cash Price = $3.75 per bushel
LATER: Corn Cash Price = $3.50 per bushel
Forward Price = $3.25 per bushel
Quantity = 1,000 bushels

SPOT (CASH) MARKET **Product: *Feed Corn***	A **FORWARD CONTRACT**: Between **Feed Suppler** and **Dairy Farmer**	
	SELLER: Feed Supplier Sells the product: **CORN** Output -> Output Price -> Revenue	**BUYER: Dairy Farmer** Buys the product: **CORN** Input -> Input Price -> Cost
TODAY **Corn Cash Price = $3.75 per bushel**	Seller and Buyer sign a forward contract TODAY: Agree on corn **quantity** to be delivered later: **Q = 1,000 bushels** and corn **price** to be paid later**:** "Forward Price": **FP = $3.25 per bushel**	
LATER/FUTURE **Corn Cash Price = $3.50 per bushel** "**CPL**"	Seller delivers corn and receives FP	Buyer accepts corn and pays FP
	Compare **Forward Price** (FP) and **Cash Price LATER** (CPL) to evaluate the **economic effects (gain or loss)** of the forward contract on Seller and Buyer	
	Compare prices: ***FP = $3.25 per bushel < CPL = $3.50 per bushel*** Calculate price difference: ***FP – CPL = $3.25 – $3.50 = -$0.25 per bushel***	
	SELLER: Feed Supplier **Economic effects** ***FP is output price: decreases*** ***Revenue decreases*** ***Profit decreases*** ***Loses -> Worse off***	**BUYER: Dairy Farmer** **Economic effects** ***FP is input price: decreases*** ***Costs decrease*** ***Profit increases*** ***Gains -> Better off***

FS Seller: Total Gain/***Loss*** ($) = Price difference ($/bu) * Quantity (bu) = ***-$0.25/bu * 1,000 bu = -$250***
FS is worse off with forward contract (would have been better off by using spot market)

DF Buyer: Total ***Gain***/Loss ($) = Price difference ($/bu) * Quantity (bu) = ***-$0.25/bu * 1,000 bu = -$250***
DF is better off with forward contract

Forward contract $ value = $3.25 per bushel * 1,000 bushels = $3,250

Question 2: Dairy Farmer: *Decision Situation #1*
Dairy farmer *purchases corn* from animal feed supplier
An *input (feed)* forward contract: *Scenario #2*

TODAY: Corn Cash Price = $3.75 per bushel
LATER: Corn Cash Price = $3.20 per bushel
Forward Price = $3.50 per bushel
Quantity = 1,000 bushels

SPOT (CASH) MARKET **Product: *Feed Corn***	A **FORWARD CONTRACT**: Between **Feed Suppler** and **Dairy Farmer**	
	SELLER: Feed Supplier Sells the product: **CORN** Output -> Output Price -> Revenue	**BUYER: Dairy Farmer** Buys the product: **CORN** Input -> Input Price -> Cost
TODAY **Corn Cash Price =** **$ _____ per bushel**	Seller and Buyer sign a forward contract TODAY: Agree on corn **quantity** to be delivered later: **Q = 1,000 bushels** and corn **price** to be paid later: "Forward Price": **FP = _____ per bushel**	
LATER/FUTURE **Corn Cash Price =** **$ _____ per bushel** "**CPL**"	Seller delivers corn and receives FP	Buyer accepts corn and pays FP
	Compare **Forward Price** (FP) and **Cash Price LATER** (CPL) to evaluate the **economic effects (gain or loss)** of the forward contract on Seller and Buyer	
	Compare prices: Calculate price difference: FP – CPL =	
	SELLER: Feed Supplier **Economic effects**	**BUYER: Dairy Farmer** **Economic effects**

Seller: Total Gain/Loss ($) = Price difference ($/bu) * Quantity (bu) = ***$300***

Buyer: Total Gain/Loss ($) = Price difference ($/bu) * Quantity (bu) = ***$300***

Forward contract $ value = $_____ per bushel * _____ bushels = $3,500

Question 3: Dairy Farmer: *Decision Situation #2*
Dairy farmer *sells milk* to cheese manufacturer
An ***output (milk)*** forward contract: ***Scenario #1***

TODAY: Milk Cash Price = $19.00 per cwt
LATER: Milk Cash Price = $18.00 per cwt
Forward Price = **$17.00 per cwt**
Quantity = 1,000 cwt

SPOT (CASH) MARKET **Product: Milk**	A **FORWARD CONTRACT**: Between **Dairy Farmer** and **Cheese manufacturer**	
	SELLER: Dairy Farmer Sells the product: **Milk** Output -> Output Price -> Revenue	**BUYER: Cheese Manufacturer** Buys the product: **Milk** Input -> Input Price -> Cost
TODAY **Milk Cash Price =** **$19.00 per cwt**	Seller and Buyer sign a forward contract TODAY: Agree on milk **quantity** to be delivered later: **Q = 1,000 cwt** and milk **price** to be paid later: "Forward Price": **FP = $17.00 per cwt**	
LATER/FUTURE	Seller delivers milk and receives FP	Buyer accepts milk and pays FP
Milk Cash Price = **$18.00 per cwt**	*Compare* **Forward Price** (FP) and **Cash Price LATER** (CPL) to evaluate the **economic effects (gain or loss)** of the forward contract on Seller and Buyer	
"**CPL**"	Compare prices: Calculate price difference: FP – CPL =	
	SELLER: Dairy Farmer **Economic effects**	**BUYER: Cheese Manufacturer** **Economic effects**

Seller: Total Gain/Loss ($) = Price difference ($/cwt) * Quantity (cwt) = ***-$1,000***

Buyer: Total Gain/Loss ($) = Price difference ($/cwt) * Quantity (cwt) = ***-$1,000***

Forward contract $ value = $17.00 per cwt * 1,000 cwt = $17,000

Question 4: Dairy Farmer: *Decision Situation #2*
Dairy farmer *sells milk* to cheese manufacturer
An ***output (milk)*** forward contract: ***Scenario #2***

TODAY: Milk Cash Price = $19.00 per cwt
LATER: Milk Cash Price = $18.00 per cwt
Forward Price = $20.00 per cwt
Quantity = 1,000 cwt

SPOT (CASH) MARKET **Product: Milk**	A **FORWARD CONTRACT**: Between **Dairy Farmer** and **Cheese manufacturer**	
	SELLER: Dairy Farmer Sells the product: **Milk** Output -> Output Price -> Revenue	**BUYER: Cheese Manufacturer** Buys the product: **Milk** Input -> Input Price -> Cost
TODAY **Milk Cash Price =** **$ _____ per cwt**	Seller and Buyer sign a forward contract TODAY: Agree on milk **quantity** to be delivered later: **Q = 1,000 cwt** and milk **price** to be paid later: "Forward Price": **FP = $ _____ per cwt**	
LATER/FUTURE **Milk Cash Price =** **$ _____ per cwt** "**CPL**"	Seller delivers milk and receives FP	Buyer accepts milk and pays FP
	Compare **Forward Price** (FP) and **Cash Price LATER** (CPL) to evaluate the **economic effects (gain or loss)** of a forward contract for Seller and Buyer	
	Compare prices: Calculate price difference: FP – CPL =	
	SELLER: Dairy Farmer **Economic effects**	**BUYER: Cheese Manufacturer** **Economic effects**

Seller: Total Gain/Loss ($) = Price difference ($/cwt) * Quantity (cwt) = ***$2,000***

Buyer: Total Gain/Loss ($) = Price difference ($/cwt) * Quantity (cwt) = ***$2,000***

Forward contract $ value = $ _____ per cwt * _____ cwt = $20,000 cwt

References

Adjemian, M.K., Brorsen, B.W., Hahn, W., Saitone, T.L., and R. J. Sexton. 2016. Thinning Markets in U.S. Agriculture What are the Implications for Producers and Processors? U.S. Department of Agriculture Economic Research Service Economic Information Bulletin Number 148. https://www.ers.usda.gov/webdocs/publications/44034/56926_eib148.pdf?v=0

Food and Agriculture Organization of the United Nations. Contract Farming Resource Centre. Contract Samples. http://www.fao.org/in-action/contract-farming/toolkit/contract-links/en/

Hamilton, N.D. 1995. Farmer's Legal Guide to Production Contracts. The National Agricultural Law Center, University of Arkansas. https://nationalaglawcenter.org/

Ling, K.C., and C.B. Liebrand. 1996. Dairy Cooperatives' Role in Managing Price Risks. U.S. Department of Agriculture Rural Business-Cooperative Service, Research Report 152. https://www.rd.usda.gov/sites/default/files/rr152.pdf

MacDonald, J.M. 2015. Trends in Agricultural Contracts. *Choices*, 3rd quarter. http://www.choicesmagazine.org/UserFiles/file/cmsarticle_461.pdf

MacDonald, J.M., and P. Korb. 2011. Agricultural Contracting Update: Contracts in 2008. U.S. Department of Agriculture Economic Research Service, Economic Information Bulletin EIB-72. https://www.ers.usda.gov/publications/pub-details/?pubid=44526

MacDonald, J.M., J. Perry, M. Ahearn, D. Banker, W. Chambers, C. Dimitri, N. Key, K. Nelson, and L. Southard. 2004. Contracts, Markets and Prices: Organizing the Production and Use of Agricultural Commodities. U.S. Department of Agriculture Economic Research Service, Agricultural Economic Report Number 837. https://www.ers.usda.gov/webdocs/publications/41702/14700_aer837_1_.pdf?v=0

Roy, E.P. 1963. Contract Farming, USA. The Interstate Printers & Publishers, Inc., Danville, IL.

Shields, D.A. 2011. Risk Management Tools for Dairy Farmers. Congressional Research Service Report R41854. https://nationalaglawcenter.org/wp-content/uploads/assets/crs/R41854.pdf

Wolf, C.A. 2012. Dairy Farmer Use of Price Risk Management Tools. *Journal of Dairy Science* 95: 4176-4183.

Wolf, C.A., and N.J. Olynk Widmar. 2014. Adoption of Milk and Feed Forward Pricing Methods by Dairy Farmers. *Journal of Agricultural and Applied Economics* 46(4): 527-541.

A Sample Milk Supply Agreement. https://www.sec.gov/Archives/edgar/data/1054040/000119312504205316/dex105.htm